B.Tech 4, 6, 7, 8 Sem (ME)

Roll No. | | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (Mechanical Engineering) (Sem.–4)

APPLIED THERMODYNAMICS

Subject Code : BTME401-18

M.Code : 77546

Date of Examination : 02-06-2025

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES:

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. **Write briefly :**

a) How is the air compressors classified?

b) What do you mean by multi-stage compression? State its advantage.

c) List the primary requirement of steam generator.

d) Distinguish between impulse and reaction turbines.

e) What is meant by saturation temperature and saturation pressure?

f) Define stoichiometric air-fuel ratio.

g) What is the main difference between boiler mountings and boiler accessories?

h) Explain the effect of friction on the performance of a steam nozzle.

i) What is Dalton's law of partial pressure applied to the condenser problems?

j) Why governing is required in steam turbine?

SECTION – B

2. Air is to be compressed in a single-stage reciprocating compressor from 1.013 bar and 15°C to 7 bar. Calculate the indicated power required for a free air delivery of 0.3 m^3/min, when the compression process is : a) Isentropic b) Reversible isothermal c) Polytropic with n=1.25.

3. Steam enters a nozzle passing a mass flow of 14 kg/s at a pressure of 30 bar and a temperature of 300°C. After expansion to a exit pressure of 5 bar, the exit velocity is 800 m/s. a) Determine the nozzle efficiency and exit area b) If the losses occur only in the divergent portion, determine the velocity of steam at the throat.

4. a) What are the four basic components of a steam power plant?

   b) What is the effect of reheat on : i) the specific output ii) the cycle efficiency iii) steam rate iv) heat rate of a steam power plant?

5. A gas fuel has the following percentage composition by volume. CO = 10%; H_2 50%; O_2 = 3%; CO_2 = 2%; & N_2 = 9%; CH_4 = 26% Estimate the minimum volume of air required for complete combustion of 1m^3 of the gas. If 50% excess air is supplied, give the volume of each of the dry constituents of the fine gas, Air contains 21% volume of oxygen.

6. Steam at a pressure of 10 bars and 0.9 dry discharges through a nozzle having throat area of 350mm^2. If the back pressure is 1.4 bar. Find (a) Final velocity of steam (b) Cross sectional area of the nozzle at exit for maximum discharge.

SECTION - C

7. In a De Laval turbine steam issues from nozzle with a velocity of 1200 m/s. the nozzle angle is 20°, the mean blade velocity is 400 m/s, and the inlet and outlet angles of blades are equal. The mass of steam flowing through the turbine per hour is 1000 kg. Take Blade velocity co-efficient as 0.8. Calculate blade efficiency :

   a. Blade angles

   b. Relative velocity of steam entering the blade

   c. Tangential force on the blade

   d. Power developed

8. a) State the advantages and disadvantages of reheated steam.

b) A steam power plant is supplied with dry saturated steam at a pressure of 10 bar and exhausts into a condenser at 0.1 bar. Calculate the Rankine efficiency by using :

i) Steam table

ii) Mollier chart

9. Why is there no chimney in case of locomotive boilers? Can we corelate maximum discharge rate of gases through the chimney for a given height of the chimney. Drive an expression.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No. | | | | | | | | | | | | |

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(ME) (Sem.–4)

THEORY OF MACHINES – II

Subject Code : BTME402

M.Code : 59130

Date of Examination: 26-05-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION – A

1. **Answer briefly:**

a) Write the equation of equilibrium of a system.

b) Define the following terms: 'inertia force' and 'inertia torque'.

c) What do you mean by 'Static force analysis'?

d) What are the requirements of an equivalent dynamical system?

e) Describe the need for balancing of rotating parts.

f) Explain the term 'Hammer blow'.

g) Define (i) normal pitch (ii) axial pitch relating to helical gears.

h) What do you understand by the term 'gear train'?

i) What do you mean by gyroscopic couple?

j) What are transmission angles?

SECTION - B

2. Determine the required input torque on the crank of a Slider Crank Mechanism for the static equilibrium when the applied piston load is 1500 N. The lengths of the crank and the connecting rod are 40 mm and 100 mm respectively and the crack has turned through 45° from the inner dead centre.

3. In a vertical double-acting steam engine, the connecting rod is 4.5 times the crank. The weight of the reciprocating parts is 120 kg and the stroke of the piston is 440 mm. The engine runs at 250 rpm. If the net load on the piston due to steam pressure is 25 kN when the crank has turned through an angle of 120° from the top dead centre, determine the (i) thrust in the connecting rod (ii) pressure on slide bars (iii) tangential force on the crank pin (iv) thrust on the bearings (v) turning moment on the crankshaft.

4. Determine the minimum number of teeth required on a pinion, in order to avoid interference which is to gear with, 1. a wheel to give a gear ratio of 3 to 1; 2. an equal wheel. The pressure angle is 20° and a standard addendum of 1 module for the wheel may be assumed.

5. Discuss how a single revolving mass is balanced by two masses revolving in different planes.

6. Design a four bar mechanism to co-ordinate the input and output angles as follows : Input angles = 15°, 30° and 45°; Output angles = 30°, 40° and 55°.

SECTION - C

7. A four crank engine has the two outer cranks set at 120° to each other, and their reciprocating masses are each 400 kg. The distance between the planes of rotation of adjacent cranks are 450 mm, 750 mm and 600 mm. If the engine is to be in complete primary balance, find the reciprocating mass and the relative angular position for each of the inner cranks. If the length of each crank is 300 mm, the length of each connecting rod is 1.2 m and the speed of rotation is 240 r.p.m, what is the maximum secondary unbalanced force?

8. A ship propelled by a turbine rotor which has a mass of 5 tonnes and a speed of 2100 r.p.m. The rotor has a radius of gyration of 0.5 m and rotates in a clockwise direction when viewed from the stern. Find the gyroscopic effects in the following conditions :

   a) The ship sails at a speed of 30 km/h and steers to the left in a curve having 60 m radius.

b) The ship pitches 6 degree above and 6 degree below the horizontal position. The bow is descending with its maximum velocity. The motion due to pitching is simple harmonic and the periodic time is 20 seconds.

c) The ship rolls and at a certain instant it has an angular velocity of 0.03 rad/s clockwise when viewed from stern.

Determine also the maximum angular acceleration during pitching. Explain how the direction of motion due to gyroscopic effect is determined in each case.

9. Two shafts A and B are co-axial. A gear C having 50 teeth is rigidly mounted on shaft A. A compound gear D-E gears with C and an internal gear G. D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D – E is mounted on a pin which projects from an arm keyed to the shaft B. Sketch the arrangement and finds the number of teeth on internal gear G assuming that all gears have the same module. If the shaft A rotates at 110 r.p.m., find the speed of shaft B.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No. | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (ME) (Sem.–4)

STRENGTH OF MATERIALS – II

Subject Code : BTME401

M.Code : 59129

Date of Examination : 29-05-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECITON - A

1. **Write briefly :**

a) What are the differences between thin cylindrical shell and thin spherical shell in terms of stresses induced when subjected to internal pressure?

b) Enumerate the difference between thin and thick cylinders under internal pressure.

c) State Maxwell's reciprocal theorem.

d) Explain the term "strain energy".

e) State any two major functions of a spring.

f) What is disc of uniform strength?

g) Explain the importance of shear centre.

h) For a crane hook, locate the plane that is severely stressed.

i) Show the graphical representation of maximum shear stress theory.

j) Enlist the various types of stresses produced in a rotating thin disc of uniform thickness.

SECTION - B

2. Drive expression for strain energy in three dimensional stress systems.

3. Derive the expressions for hoop and longitudinal stresses for a thin spherical vessel of internal diameter d, material thickness t and subjected to internal fluid pressure p.

4. The principal stresses at a point in an elastic material are 100N/mm^2 (tensile), 80 N/mm^2 (tensile) and 50N/mm^2 (compression). If the stress at the elastic limit in simple tension is 200N/mm^2, determine whether the failure of material will occur according to maximum principal strain theory. If not, then determine factor of safety.

5. A close coiled helical spring, made out of 8 mm wire, has 18 coils. Each coil is of 8 cm mean diameter. If the maximum allowable shear stress in the spring is 140 MPa, determine the maximum allowable load on the spring and elongation of the spring. Take G = 82 GPa.

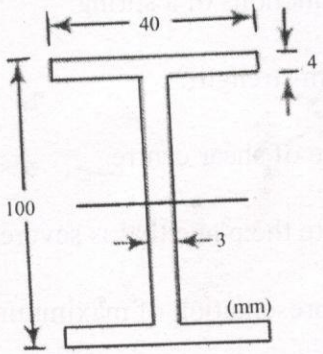
6. A curved bar of 30 mm square section has a mean radius of curvature of 45 mm. Assuming the bar initially to be unstressed, find the stresses at the inner and the outer faces when a bending moment of 350 N.m is applied to the bar tending to straighten it.

SECTION - C

7. A thick cylinder of Steel, having an internal, diameter of10 cm and an external diameter of 20 cm, is subjected to an internal pressure of 80 MPa and an external pressure of 10 MPa. Find the maximum normal and shearing stresses in the cylinder. E = 200 GPa and Poisson's ratio = 0.3.

8. A flat disc made up of steel, having a diameter of 1.2 m, rotates at a speed of 2700 rpm. Determine the intensities of radial stress and hoop stress at the centre and at the external fibre. Consider Poisson's ratio = 0.3 and density of steel = 7800 Kg/m^3.

9. A I beam (section shown in figure) is subjected to a shear force of 20 kN. Find the transverse shear stress at the top of the web and bottom of the flange. Also draw the variation of shear stress along the section.



NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No. | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech (ME) (Sem.–4)

THEORY OF MACHINES-II

Subject Code : BTME405-18

M.Code : 77550

Date of Examination : 22-05-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. **Write briefly :**

a) Write the condition of equilibrium for a two force system?

b) What is dynamically equivalent system?

c) Write the disadvantage of helical gear over spur gear.

d) ***'Reciprocating masses cannot be balanced completely'.*** Why?

e) Define velocity ratio in context to gear train.

f) Name two phases of kinematic synthesis.

g) Compare involutes and cycloidal tooth profiles.

h) What do you understand by dimensional synthesis of pre-conceived type of mechanism?

i) What is least square technique and explain its utility in synthesis of mechanisms?

j) What do you mean by spin, precession as related to gyroscope?

SECTION - B

2. Derive the expression for velocity and acceleration of slider of a single slider crank mechanism.

3. Four masses m_1, m_2, m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 015 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75° and 135°. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m.

4. Derive a relation for minimum number of teeth on a pinion to avoid interference with a rack.

5. In a spiral gear drive connecting two shafts, the approximate centre distance is 400 mm and the speed ratio = 3. The angle between the two shafts is 50° and the normal pitch is 18 mm. The spiral angles for the driving and driven wheels are equal. Find :

   a) Number of teeth on each wheel.

   b) Exact centre distance

   c) Efficiency of the drive, if friction angle = 6°.

6. Write in detail about two position syntheses for four bar mechanism.

SECTION – C

7. In a reverted epicyclic gear train, the arm F carries two wheels A and D and a compound wheel B-C. The wheels A meshes with wheel B and the wheel D meshes with wheel C. The numbers of teeth on wheel A, D and C are 80, 48 & 72 respectively: Find the speed & direction of wheel D when wheel A is fixed and arm F makes 20rpm clockwise?

8. The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 r.p.m. clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship: (a) when the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h. (b) when the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees.

9. **Explain the following :**

   a) Considerations of frictional forces.

   b) Estimation of velocity ratio of worm and worm wheel.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ME) Sem.–4)

APPLIED THERMODYNAMICS–II

Subject Code : BTME404

M.Code : 59132

Date of Examination : 22-05-2025

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION - A

1. **Answer briefly :**

   a. Classify the compressors.

   b. Define isothermal efficiency.

   c. What do you understand by surging?

   d. State the principle of jet propulsion.

   e. Write advantages of ramjet engine.

   f. Define blade efficiency.

   g. Write classification of gas turbine.

   h. Write field application of axial flow compressor.

   i. Name Gas turbine fuels.

   j. Write the types of rocket motors.

SECTION - B

2. Describe the working of single stage reciprocating compressor with a suitable sketch.

3. Discuss the significance of intercooling upon the performance of multi-stage compression.

4. Write the comparison between the axial flow compressor and centrifugal compressors.

5. Explain the stalling and its effect on the compressor performance.

6. Compare turbojet engine with other jet propulsion engines.

SECTION - C

7. Compare the influence of reheating, regeneration and inter-cooling on performance of gas turbine cycle.

8. Show that the heat rejected in each stage of a reciprocating compressor with perfect inter-cooling is given by,

$$Q = \left[C_p + C_v \left(\frac{\gamma - n}{n - 1} \right) \right] T_2 - T_1$$

9. A jet propulsion engine has compressor with pressure ratio 4 and compressed air enters into combustion chamber where combustion occurs so as to yield temperature of 500°C at turbine inlet. Actual temperature at inlet to combustion chamber is 10% more than that of isentropic compressor temperature rise. Exhaust from turbine is expanded up to atmospheric pressure of 1 bar. The ambient temperature is 285 K. Determine, a) power required to drive compressor, b) air fuel ratio if calorific value of fuel is 43100 kJ/kg, c) static thrust developed per kg of air per second.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Mechanical Engineering) (Sem.–4)

MATERIALS ENGINEERING

Subject Code : BTME404-18

M.Code : 77549

Date of Examination : 19-05-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. **Write briefly :**

   a. State Pauli Exclusion Principle.

   b. What do you mean by bonding energy?

   c. What is metallic bonding?

   d. Define coordination number.

   e. What do you mean by interstitial diffusion?

   f. What is Gibb's phase rule?

   g. Write the peritectic reaction observed in Fe-Fe_3C phase diagram.

   h. State the difference between Pearlite and Bainite.

   i. What is Martensite? How this phase can be obtained in steel?

   j. Differentiate between austenitic and ferrite stabilizers in alloy steels.

SECTION - B

2. Explain Burgers vector. Using suitable sketch, explain edge dislocation.

3. Discuss the various mechanisms of diffusion.

4. With the help of relevant portion of Fe-Fe_3C phase diagram, explain the difference between full annealing and normalizing treatments.

5. Explain the pack-carburizing process. Discuss the disadvantages of this process.

6. Discuss the factors affecting hardenability of steel.

SECTION - C

7 Discuss the construction of TTT diagram for eutectoid steels. Using this diagram explain the isothermal annealing process.

8 Give the classification of alloying elements in steels? Discuss the effects of adding Mn, Ni, Cr and V as alloying elements on the properties of steels.

9 **Write short notes on the following :**

a. Recovery and recrystallization.

b. Stages of Tempering process.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ME) (Sem.–4)

FLUID MECHANICS

Subject Code : BTME-403

M.Code : 59131

Date of Examination : 19-05-2025

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. **Answer briefly:**

a) Explain how certain insects are able to walk on the surface of the water?

b) What forces act on a fluid element in static equilibrium?

c) Differentiate between normal and tangential acceleration.

d) What are assumptions made in deriving Bernoulli's equation?

e) What do you understand by momentum correction factor?

f) What is physical significance of Froude's number?

g) Define geometric, kinematic and dynamic similarity.

h) Explain minor losses in pipes.

i) Define stream line function and potential function.

j) Explain vena-contracta.

SECTION - B

2. Derive Euler's equation along a stream line. State the various assumptions used.

3. The velocity distribution for a three dimensional flow is given by u = -x, v = 2y and w = 3 - z. Find the equation of stream line passing through (1, 1, 2).

4. A tank 3m x 4m contains 1.2 m deep oil of specific gravity 0.8. Find,

   a) Intensity of pressure at the base of the tank.

   b) Total pressure at the base of the tank.

5. Explain rotameter with a neat sketch.

6. A pipe 300 m long has a slope of 1 in 100 and tapers from 1.2 m diameter at the high end to 0.6 m diameter at the low end. Quantity of water flowing is 5400 litres per minute. If the pressure at the high end is 68.67 kPa, find the pressure at the low end.

SECTION - C

7. A solid cylinder of 360 mm long and 80 mm diameter has its base 10 mm thick of specific gravity 7. The remaining part of cylinder is of specific gravity 0.5. Determine if the cylinder can float vertically in water.

8. Assuming that the rate of discharge Q of a centrifugal pump is dependent upon the mass density p of fluid, pump speed N (rpm), the diameter of impeller D, the pressure P and the viscosity of the fluid μ. Show using Buckingham's π-theorem that it can be represented by

$$Q = ND^3 \phi\left[\left(\frac{gH}{N^2D^2}\right), \left(\frac{v}{ND^2}\right)\right]$$

   where H = head and V = kinematic viscosity of the fluid.

9. Derive continuity equation in Cartesian coordinates.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ME) (Sem.–4)

MANUFACTURING PROCESSES-II

Subject Code : BTME 405

M.code : 59133

Date of Examination: 05-05-2025

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. **Answer briefly:**

   a. What is meant by breakdown passes in rolling?

   b. How is upsetting different from fullering in forging?

   c. Differentiate between coining and embossing.

   d. What is metal spinning? What types of components are generally manufactured by this process?

   e. What are the various methods available for making metal powder?

   f. What are the various forms of wear found in cutting tools?

   g. What is a tool signature? Explain.

   h. Differentiate between up milling and down milling.

   i. Explain how effective tungsten carbide is as a cutting tool material in comparison to the other cutting tool materials.

   j. Briefly explain the difference between a shaper and a planer.

SECTION - B

2. ***'Extrusion is a process involving three-dimensional compression'***. Explain why brittle materials can be worked by extrusion more successfully than by some other metal working methods.

3. Define the powder metallurgy process. Why are protective atmospheres necessary in sintering? Explain the difference between impregnation and infiltration. Give some applications of each.

4. How do you define the terms machinability and tool life? Explain the parameters that control the tool life of a single-point cutting tool.

5. Describe the differences between a lathe and a milling machine in terms of the types of surfaces generated, the types of tools used and their applicability for production applications.

6. In grinding, which process parameters (machine and grinding wheel) are significant for the following purposes and why (i) to get a good surface finish (ii) to grind work materials of different hardness?

SECTION - C

7. Explain the principle and working of the electro-hydraulic forming process with a neat sketch. Also, state its advantages, limitations and applications.

8. a. Give a schematic sketch of the shaper labeling important parts and their functions.

   b. What are the various types of milling cutters that are used in milling?

9. **Write a short note on the following :**

   a. Ceramics and diamonds

   b. Broaching machine classification and description.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No. | | | | | | | | | | | |

Total No. of Questions : 09

Total No. of Pages : 02

B.Tech. (Mechanical Engineering) (Sem.–4)

STRENGTH OF MATERIALS-II

Subject Code : BTME-403-18

M.Code : 77548

Date of Examination : 05-05-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly:

a. Define resilience.

b. What is strain energy of a material?

c. Express mathematical form of maximum shear strain energy theory of failure.

d. Why few full-length leaves are provided in leaf springs?

e. What is flat spiral spring? List it's application.

f. In terms of stresses induced, explain the difference between thin and thick cylindrical shells.

g. Explain the importance of wire winding of thin cylinders.

h. State the assumptions made during the analysis of bars having large curvature (Winkler-Bach theory).

i. Explain why connectors, such as riveting, bolting or welding are provided in built-up beams?

j. What is disc of uniform strength?

SECTION-B

2. State and prove Maxwell's reciprocal deflection theorem.

3. Explain the maximum principal stress theory of failure. Compare it graphically with maximum shear stress theory.

4. A wagon weighing 40 kN moves at a speed of 3.6 km/h. Find the number of springs required in a buffer stop to absorb the energy of motion during a compression of 175 mm. The mean diameter of coils is 200 mm and the diameter of the steel rod of the spring is 20 mm. Each spring consists of 30 coils. Take G = 80 GPa.

5. A 6 m long thin cylindrical shell is 800 mm in diameter and 10 mm thick. It is subjected to an internal pressure of 4 MPa. Determine the change in it's diameter. Take E = 205 GPa and v = 0.3.

6. Obtain the general expression to estimate shear stress across a beam having rectangular section. Find its' maximum value and location in the beam.

SECTION-C

7. Deduce expression to determine the stress in a circular ring acted upon by a tensile load W.

8. A thick cylinder has inner and outer diameters as 100 mm and 170 mm respectively. It is subjected to an external pressure of 10 MPa. Find the value of the internal pressure which can be applied if the maximum stress is not to exceed 35 MPa. Draw the curves showing the variation of hoop and radial stresses through the material of the cylinder.

9. Derive the governing equations for radial and hoop stresses induced in a flat rotating disc of uniform thickness. And hence deduce the expressions for maximum radial stress in a solid disc

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No. | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Ai & DS / AI & ML / CSE / CS / DS / Internet of Things and Cyber Security including Block Chain Technology) (Sem.–4)

OPERATING SYSTEMS

Subject Code : BTCS-402-18

M.Code : 77628

Date of Examination: 05-05-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. **Write briefly :**

a) Discuss access methods of a file.

b) Differentiate between physical and logical address space.

c) Discuss criteria used to measure CPU performance.

d) What is real time operating system? Explain briefly.

e) Briefly explain the functions performed by an Operating System.

f) Discuss directory structure.

g) Discuss architecture of operating system.

h) What is a thread? Discuss types of threads.

h) What are Boot Block and Bad Block?

j) What do you understand by Disk Formatting? How it is done?

SECTION - B

2. What do you understand by a process? Draw the state transition diagram and explain the purpose of each state.

3. Explain with example FCFS and Round Robin scheduling algorithms.

4. Compare static and dynamic contiguous partitioned memory management schemes.

5. Explain various methods which are used for free space management during file management.

6. Explain Multi programming and Time Sharing operating systems.

SECTION - C

7. What is a deadlock? Explain the necessary conditions for deadlock occurrence. Discuss any method used for deadlock avoidance with example.

8. What do you mean by virtual memory? How it is implemented? Explain various techniques used to manage the virtual memory.

9. What do you mean by disk scheduling? Explain in detail the various disk scheduling algorithm with the help of suitable example.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No. | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Mechnical Engineering) (Sem.–4)

FLUID MACHINES

Subject Code : BTME402-18

M.Code : 77547

Date of Examination : 06-06-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION - A

1. **Write briefly :**

a) Why is curved plate preferred over flat plate in hydraulic turbines?

b) Write Euler equation for energy transfer in turbo machines.

c) What do you mean by degree of reaction?

d) Define cavitation.

e) Name the various problems commonly experienced during operation of centrifugal pumps.

f) What do you understand by governing of a Pelton turbine?

g) Define specific speed of pump.

h) What is the negative slip in reciprocating pumps?

i) What is the function of hydraulic crane?

j) Why the buckets of Pelton wheel are provided with an under-cut.

SECTION - B

2. A jet of water of diameter 40 mm moving with a velocity of 30 m/s strikes a curved fixed symmetrical plate at the centre. Find the force exerted by the jet water in the direction of the jet if the jet is deflected through an angle of 120° at the outlet of the curved plate.

3. Discuss in detail the working of hydraulic ram with diagram.

4. Show from the first principles that work saved in a single-acting reciprocation pump, by fitting an air vessel is 84.8 per cent.

5. The diameter of a centrifugal pump at inlet and outlet are 30 cm and 60 cm, respectively. Find the minimum starting speed of pump if it works against a head of 30 m.

6. With the help of a neat diagram, explain the working principle of fluid coupling. Also, describe the slip and the efficiency of the fluid coupling.

SECTION - C

7. A single acting reciprocating pump has a bore of 15 cm and a stroke of 30 cm. The suction pipe has a diameter of 10 cm and is fitted with air vessel. Find rate of flow into or from air vessel at $\theta = 30°$ and 90°. Also, find crank angle at which there is no flow into or from air vessel. The pump runs at 120 rpm and the piston has S.H.M.

8. What are performance curves? Discuss importance and plotting of these curves in detail for impulse and reaction turbines.

9. A Pelton turbine is required to produce 6 MW power when working under a head of 300 m. The turbine r.p.m. is 550 and the overall efficiency is 0.85. The turbine works with three jets. Determine :

   a) The diameter of the runner

   b) Discharge per second

   c) Diameter of the jet

   d) Number of buckets

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.